RESEARCH BULLETIN 1070 APRIL 1974

An Ohio Case Study

The Expanded Food and Nutrition Education Program: An Experiment in Behavioral Change

TED L. NAPIER and CAROL WHARTON

OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER
WOOSTER, OHIO

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ACKNOWLEDGMENTS

The authors express their appreciation to Dr. Marjory Mortvedt and Dr. Anita McCormick for their aid and counsel during the conduct of this research effort. The authors thank Judy Houser and Toni Hill for their secretarial support during the conduct of this research.

AGDEX 884

4-74-3.5M

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TED L. NAPIER and CAROL WHARTON[1]

INTRODUCTION

The primary purpose of this bulletin is to present results of a study evaluating the effectiveness of the Expanded Food and Nutrition Education Program (EFNEP) of the Ohio Cooperative Extension Service in a selected county in northeastern Ohio. Participant families were studied to determine if changed behavioral patterns were identifiable in terms of food consumption practices during a 12-month period. Food knowledge change was also evaluated to determine if attitudes toward established behavioral patterns were modified during the course of program involvement.

The Expanded Food and Nutrition Education Program was initially funded by the U. S. Dept. of Agriculture from import duties received on agricultural products. No direct taxes were involved. (The program is now supported by Smith-Lever funds.) Ohio received a $364,000 grant to establish the EFNEP starting in January 1969. Sixteen Ohio counties were involved in the initial phase of the program. Each of the state's eight most populous counties were allocated $38,000 for the first 6 months of the program, while eight smaller counties received $7,000 each for the first 6 months. After July 1969, the 16 counties received proportionate allocations from the federal government for continuation of the program.

This study was organized to determine the relative impact of the program and the results reveal that significant changes occurred during the 12-month period. The participant families as a group experienced a change in their food consumption behavior toward the accepted norm of the 2-2-4-4 food pattern as it was operationalized in this research effort. It was noted, however, that the greatest improvement occurred in the first 6 months of the program for the total group, with a decreasing rate of improvement for the second 6 months.

[1]Ted L. Napier is an assistant professor, Dept. of Agricultural Economics and Rural Sociology, Ohio Agricultural Research and Development Center and The Ohio State University. Carol Wharton is a former research associate in the department.

EFNEP IN HISTORICAL PERSPECTIVE

Millions of Americans are defined as economically underprivileged (11). While the percentage of poor people in the United States has been steadily declining, the difficulties of the American underprivileged remain a significant development problem. Numerous efforts to elevate the life style of the poor have met with failure or at best marginal success, since large numbers of Americans remain economically poor.

One characteristic of economic poverty has been low levels of nutrition among underprivileged family members, which is a contributing factor to the maintenance of the poverty subgroup. For example, a family with severe income restraints may not be able to sustain a diet defined as nutritionally adequate by contemporary middle-class standards. Severe malnourishment in the formative years has extremely undesirable consequences for later physical maturation and may also limit social maturation. The combination of these physical and social restraints could result in lessened economic potential and productivity.

The realization that nutritional levels have significant impact upon later social maturation helped give impetus to the development and expansion of programs designed to elevate the food consumption of the lower classes. Two pre-EFNEP programs deserve special mention. They were the Direct Distribution Program[2] and the Food Stamp Program (6, p. 5). Both programs were to some degree concerned with the nutritional problems created by insufficient financial resources of low-income families.

Direct Distribution Program

The Direct Distribution Program was developed in 1935 with the goals of: 1) removing surplus farm commodities from the trade market, and 2) feeding low-income people, many of whom were on public welfare. The major difficulty with the direct distri-

[2]The Direct Distribution Program originated with the Agricultural Adjustment Act of 1935. It reached its peak in importance about 1962.

bution plan was that removal of surplus commodities, which had accumulated as a result of the government's price-supporting activities, was the first priority. The quantity and variety of food distributed to needy families varied according to the USDA's price-supporting activities, rather than the dietary needs of the commodity recipients.

The Direct Distribution Program did not achieve the goal of providing low-income families with adequate diets and it was challenged. The Citizens' Board of Inquiry noted the relative inadequacy of the Program when it stated, "the variety of food distributed under the commodity distribution program is not adequate to insure minimal nutritional requirements" (7, p. 56).

Food Stamp Program

As an alternative to the Direct Distribution Program, the Food Stamp Program was initiated in 1961.[3] Its objective was to provide an economic means of improving a family's diet by enabling the participants to increase their food purchasing power through the use of subsidized food stamps. Low-income families were permitted to purchase food stamps on a graduated scale depending upon family size and economic resource base. These stamps could be used in the regular channels of trade. The food stamp recipients were also permitted to choose from a wider variety of foods. In this regard, the Food Stamp Program was an improvement over the previous efforts since recipient families could purchase foods of their own preference and needs (some restraints were applied but considerable flexibility was purposely incorporated in the program) (7, p. 10).

Neither of the early food supplement programs had considered that extensive consumer skill and knowledge were required by low-income families in purchasing and preparing foods. It became obvious that if the recipients of the commodities or the food stamps were to gain maximum benefit from these programs, an educational program was essential to enhance their skills in several informational areas.

When the Food Stamp Program was established, Secretary of Agriculture Orville L. Freeman predicted that the program would correct the deficiencies of the commodity surplus program by supplying low-income families with additional purchasing power which would permit recipients to purchase a wider variety of foods of their own choosing and thereby improve their diets (7, p. 57). Evaluation of the impact of several local food stamp programs, however, revealed that in reality many program participants had only slightly improved their nutritional levels over nonparticipants. The problem appeared to be associated with consumer behavior and preparation of foods. In essence, the problem appeared to be one of knowledge: "To improve one's nutritional health on a few cents a day requires more knowledge and meal planning than the average individual possesses" (7, pp. 64-65).

Inadequate income to buy sufficient quantities of food apparently was further complicated by the inability of many shoppers to maximize their purchasing power. For example, Americans do not consume the lowest-cost food items (13, p. 52). Lower-class family units often live close to small independent stores where prices may be higher than in large supermarkets (10, p. 9). Due to transportation problems, in terms of availability and cost, the low-income consumer may have little choice where she shops. Another compounding factor is the lack of opportunity for low-income shoppers to take advantage of special sale prices. Limited resources make it impossible for them to buy extra quantities of sale items or larger packages of products which are often cheaper per unit than the smaller packages. The less one has to spend on food, the more skilled one must be in purchasing and preparing food. One also has less choice in the variety and quality of foods available at lower prices (11, p. 6).

Caplovitz's (2, pp. 331-345) work confirmed that low-income consumers face three major problems: lack of cash, lack of credit, and lack of information. The result of economic restraints upon low-income shoppers is that they often do not follow sale announcements in the newspaper, do not engage in comparative shopping (10, p. 9), and do not patronize the larger supermarkets which often offer the same items for lower cost than small independent stores. Each of these restraints are operative for low-income families and differences in terms of consumer skills and preparation of foods could negate benefits from any program which assumes clients possess such skills.

Engel observed an inverse relationship between income and the percent of total expenditure spent for food (13, p. 50). In the United States, a family which has to use more than one-third of its income (based on the yearly Consumer Price Index) to provide a minimum diet is defined as economically poor (4, p. 25). Within this definitional framework, the USDA has developed low-cost food plans based on minimum incomes needed to purchase a sufficient amount of food to prevent nutritional deprivation. This minimum income varies according to the size and composition of a household. However, the USDA emphasizes that effective utilization of the food plans requires expertise in purchasing and pre-

[3]An earlier Food Stamp Program began in 1939 but was abolished in 1943.

paring foods (7, p. 62). Roundtree (15, p. 12) summarizes this position by noting, "No housewife without a considerable knowledge of the nutritive value of different foodstuffs and considerable skill in cooking would be likely to choose a menu at once so economically and comparatively attractive . . ."

While Roundtree's work was published prior to many of the service-type foods such as pre-cooked and convenience frozen foods, the principle is still applicable. The basic argument is that homemakers must possess extensive knowledge about food preparation and consumer skills if they are to effectively utilize their purchasing power. This information suggests that knowledge and skills necessary to maintain an adequate diet on an income of minimum or below-minimum living standards are not often found among low-income consumers.

The planners of the Food Stamp Program apparently assumed that food stamp recipients possessed considerable knowledge of the nutritional value of foods, the effective use of leftovers, the value of quantity buying, and the ability to plan before shopping. These assumptions appear to have questionable validity. The Food Stamp Program requires a housewife to purchase a month's supply of food stamps which must be carefully allocated during that time. It is highly probable that even sophisticated shoppers would have difficulty allocating these monthly expenditures under the economic restraints of low-income people.

Establishment of EFNEP

Recognition of the educational skills needed to effectively use the Food Stamp Program was a first step in establishing the Expanded Food and Nutrition Education Program. The Citizens' Board of Inquiry for hunger and malnutrition in the United States made the following recommendation upon completion of its intensive study of the dietary problems in this nation:

"Either the Department of Health, Education, and Welfare or the Office of Economic Opportunity should be directed and funded to employ and soundly train a large number of food stamp recipients . . . as nutrition and health care extension workers among the poor . . ." (7, p. 86).

Secretary of Agriculture Freeman added further support to the educational movement when he testified at a Senate Subcommittee Hearing that a nutrition education program was the only effective way of explaining the Food Stamp Program and insuring that the families participating would benefit from the stamps (7, p. 68).

Recognizing the necessity for an educational program, the U. S. Department of Agriculture's Extension Service initiated the Expanded Food and Nutrition Education Program among low-income families in 1968. The goal of the EFNEP is: "to upgrade the diets of low-income families through education" (8, p. 1). This goal includes an emphasis on individual educational assistance in which homemakers are visited in their homes and given information most pertinent to their particular needs.

The educational needs of low-income homemakers, however, are often more complex than learning how to plan a meal. For example, the homemaker could conceivably need help in improving the physical condition of the kitchen, or individual family members may have special dietary needs which require specific nutritional expertise. In establishing the EFNEP, the Extension Service was aware that numerous problems not directly associated with food preparation or consumer behavior might have to be resolved before nutritional training could begin. It was reasoned that once these special needs were confronted and resolved, the participants would be more receptive to an educational program which focused on the various aspects of nutrition, food buying, storing, preparation, meal planning, and sanitation.

Operation of EFNEP[4]

Aide Selection: The Extension Service employs and trains para-professional aides to make periodic visits to the homemakers of low-income families to provide information concerning food and nutrition and related subjects (8, p. 4). Most of the aides are residents of the same neighborhoods and are from the same general socio-economic level as the families they visit. The program planners assumed that this practice of employing indigenous aides would facilitate rapport and communication between the aide and the families (5, p. 4).

The aides are recruited through various news media, organizations, and personal contacts by EFNEP personnel. The aides must be able to read and write and to participate in an initial training program designed to prepare them to teach their clients about foods and nutrition. Since the program is independently administered by the Cooperative Extension Service in each participating county, requirements for aides and participating families vary to some degree in each locality.

In the county selected for analysis, the neighborhood aides are required to have a high school diploma or its equivalent, and to live in the neighborhood where they expect to work. The senior aide is required to have had some professional home economics training and to be capable of managing the organizational and supervisory aspects of the program in her

[4]The procedures have been modified significantly by the Extension Service since this research was conducted.

area. The senior aide is also given initial orientation training by the county Extension home economist.

Selection of Participants: Since the EFNEP is administered independently in each participating state, the method of selecting participants varies according to the state and in some instances by the county. In Ohio, the primary criterion for an area to be included in the program is that the majority of the inhabitants must be classified as low-income families.

In the county selected for analysis, the target areas of the EFNEP often correspond to neighborhoods previously selected as Office of Economic Opportunity development areas. In most instances, anyone living in a designated program area can participate in the EFNEP since it is assumed that the majority of people living in the area will have economic resources below the level required for an adequate diet (12, p. 34).

Occasionally a homemaker with relatively higher economic resources will enter the program. In this situation the neighborhood aide is expected to move the homemaker through the home visit program quickly and to encourage her to participate in other Extension activities, rather than remaining as a long-term participant in the EFNEP (12, p. 9).

Information Obtained: During the initial contact period, the aide completes a family record containing information relative to the characteristics of the client family. The information includes place of residence, family size and composition, age of each family member, education of the homemaker, family income, race, type of facilities available in the home, whether or not the family is participating in food assistance or welfare programs, and whether the family shops at a supermarket or a small neighborhood store. The aide updates the family record yearly, or whenever significant change occurs in the family composition or situation. The purposes of the family record are: 1) to familiarize the aide with the family's individual characteristics and needs in order to structure a program most beneficial to the particular needs of that family, and 2) to serve as a source of information for a program reporting system (8, p. 2).

A food reading[5] is administered by the aide at the initial contact with the client family and at 6-month intervals. The food reading provides information on the family's food consumption practices and the homemaker's food knowledge[6] and may be compared with future readings to ascertain the type of changes resulting from program participation. The food reading also provides the aide with information on deficiencies in the family's food consumption pattern so that concentrated effort may be directed toward eliminating those problems.

[5]A food reading includes the family's last monthly income, the percentage of that income used to purchase food, and the homemaker's food consumption and food knowledge. The food reading is a supplement to the family record data.

[6]Food knowledge data are no longer collected by the EFNEP personnel.

THEORY FORMATION

Behavioral and Perceptual Changes Resulting from EFNEP Participation

The basic goal of the EFNEP is to improve the food consumption behavior of client families. A recent USDA study reported that EFNEP participants increased their use of less expensive but more nutritional foods after involvement in the program (12, p. 18). The conclusion drawn from the study was that the EFNEP produced a positive behavioral change among participant families. Apparently the EFNEP was effective in bringing about an increased awareness among the client homemakers that more *balanced* diets are desirable and in providing the expertise necessary to achieve nutritious meals at lower costs.

It was in this context that the major hypothesis for testing in the present study was formulated. This hypothesis states: *Food consumption practices of client homemakers will be significantly improved as a result of participation in the EFNEP.*

The Role of Information in Behavioral Change

Behavioral change is facilitated by providing information to people. Individuals must be made aware that existing behavioral patterns may be dysfunctional if they are to consider adopting new modes of behavior. Bohlen (1) argues that in the diffusion and adoption process, people must be made aware of the need for changes and be provided information about the proposed changes before consideration can be given to adoption. The EFNEP provides an additional mechanism for the dissemination of information relative to nutrition and provides the opportunity for client families to become aware of alternative foods and various methods of food preparation. It is therefore argued that nutritional training will result in improved awareness of the norm of optimum food consumption.

The optimum level of foodstuff consumption was defined as the daily intake of foods from the four basic food groups in a ratio of two servings from each of the first two groups and four servings from each of the latter two groups. The four food groups are: 1) milk and milk products; 2) meat, poultry, fish, and eggs; 3) vegetables and fruits; and 4) breads and cereals. Due to the proportionate servings recommended from each food group, the food plan is often referred to as the 2-2-4-4 program. This norm was

adopted by the EFNEP as a means of evaluating the effectiveness in bringing about food consumption changes.[7]

It was reasoned that the homemaker would reflect the educational training provided by the program by increased awareness of what constitutes an optimum level of food consumption. Therefore, it was hypothesized that: *Food knowledge*[8] *will be significantly improved as a result of participation in the Expanded Food and Nutrition Education Program.* This hypothesis was predicated on the fact that client families would be made aware that certain food patterns were more desirable than others. This should result in the homemaker internalizing the belief that the 2-2-4-4 food pattern is the desirable food consumption norm to be achieved, even if she does not have the means or knowledge of food preparation to achieve it.

Cognitive Dissonance and Its Analytical Usefulness

While individuals may perceive a particular change as being desirable, it is possible that adoption of the change may be relatively slow. Diffusion and adoption research (14) has demonstrated that awareness often takes place far in advance of adoption. This suggests that an EFNEP participant homemaker could be made aware of the need for improved food plans, but the behavior exhibited could be contrary to this knowledge. If such a situation should exist, the homemaker would be placed in a situation of cognitive dissonance.

The theory of cognitive dissonance states that when a person is introduced to new information which is inconsistent with ideas presently held or with internalized behavioral patterns, a conflict situation emerges. In his analyses of cognitive dissonance, Festinger (9, p. 42) submits that a person will strive to reduce the dissonance situation by reconciling one belief with the opposing one. The method of reducing the cognitive dissonance varies among individuals (3, pp. 154-155).

An EFNEP participant could easily be placed in a situation of cognitive dissonance and may respond in several ways. She may rationalize her position by saying that the optimum level of food consumption is not really the most desirable food plan for her family. On the other hand, she may adopt the new standards as the norm for the family and thereby reduce the cognitive dissonance. It is also possible to have modification of the existing food plan practices and partial adoption of the 2-2-4-4 food plan. The last alternative is probably the most feasible, since gradual acceptance of social change is probably more reflective of real situations.

The effectiveness of the EFNEP can be analyzed in terms of the dissonance reduction theory, since the homemaker should modify behavior to be consistent with the information provided by EFNEP aides. Education is provided which demonstrates the advantage of the 2-2-4-4 food plan while also noting the potential consequence for the family if inadequate food plans are maintained. The decision to accept or reject the program norms, however, remains with the client homemaker.

It is argued that the information base provided by the EFNEP should result in awareness of the established nutritional norm of the society. With the operation of dissonance reduction, the differences between awareness and actual behavior should be reduced. Consistent with this theoretical position, two hypotheses were formulated for testing. It was hypothesized that: 1) *EFNEP participants will be placed in cognitive dissonance situations in which food consumption behavior will be less rapidly modified than perception of what constitutes a balanced food plan program,* and *2) EFNEP participants will reduce the cognitive dissonance situation by reconciling the differences in the direction of the adoption of the 2-2-4-4 food plan as the established norm of the family units.*

In summary, these hypotheses predict that a positive change in food consumption behavior of the homemaker will occur as a result of the diffusion of information about the food consumption norm of 2-2-4-4. It is further argued that in the initial stages of program participation, a discrepancy will be present between the perceived optimal food plan and actual food consumption which will result in cognitive dissonance. The cognitive dissonance, however, will be reduced as shifts in consumption behavior occur due to continued participation in the educational program.

Demographic Characteristics and Food Consumption Change

While it is argued that behavioral change due to the diffusion of information will result in collective movement toward the 2-2-4-4 norm, it is also contended that individual and familial characteristics will enhance or retard the movement toward the optimum food consumption level. The variables selected for further examination were family size, educational achievement level, number of facilities available in the home, and the income level of the family unit.

[7] It should be noted that the 2-2-4-4 food plan has a major limitation in that quality aspects of the plan are subject to criticism. Few qualitative controls are applied in using this technique. Therefore, the plan is termed optimum level of foodstuff consumption rather than a balanced diet.

[8] Food knowledge was defined as the awareness among the client homemakers of the requirements of the optimum food consumption pattern (2-2-4-4).

Family Size: In family units having comparable incomes, the larger families should benefit more from the program than smaller ones since allocation of resources per family member would be smaller for the larger families. It would be more difficult to budget resources to adequately feed a large family from a limited income than for a smaller family with the same income. Nutrition education aides are prepared to offer instructions in money management which should be useful to a homemaker who expresses difficulties in budgeting and comparative shopping. Therefore, the EFNEP should be more beneficial in providing expertise for the maximization of purchasing power in larger families.

Educational Achievement: While an individual's level of education does not necessarily reflect reasoning ability, it is logical to assume that an individual acquires more skill in learning as he advances through school. Learning theory contends that increased elaboration of behavior results from a "continuous formation of connections among stimuli and response" (16, p. 174). In other words, client homemakers with more formal education should have greater probability of understanding and effectively using EFNEP information than those with less formal education.

Home Facilities: The relationship of home facilities to the impact of the EFNEP should be positive. If a homemaker has access to such facilities as an oven and refrigerator, she may be able to utilize information more effectively. For example, if one training session emphasized the economic advantages of buying large quantities of foods when reduced prices are in effect, possession of a freezer would facilitate the storage of those foods for a longer period of time. Other aspects of food consumption and food knowledge also are affected by the number of facilities available to a family.

Income Level: Higher income families should benefit from the program to a greater extent than lower income families because additional purchasing power should add to the potential for effective use of additional knowledge. If economic restraints are so great that few alternatives are available to the client family, then little can be achieved regardless of the type of program developed.

In summary, it was hypothesized that as family size increases, educational achievement levels increase, the number of facilities in the home increase, and income levels increase, there will be a corresponding improvement in the dependent variables (actual behavior and food knowledge of the homemakers).

AN OHIO CASE STUDY

Methodology

A research study was organized to evaluate the validity of the theoretical position presented. The Extension staff provided access to family records in several Ohio counties. Since many of the records were unsuitable for analysis purposes, several counties were eliminated from consideration which preempted a random sampling of EFNEP participant families throughout the state. One county in northeastern Ohio had sufficiently complete records for analysis and was chosen for the case study. Since the research effort was confined to the EFNEP in the one county which had adequate family and food record data, the findings may not be generalized beyond the group analyzed.

A sample of 148 participant families was drawn from the selected county's family record files for analysis. The primary criterion used in the selection was that the client family must have been involved in the EFNEP for at least 1 year. A second criterion required that the client family must have joined the program no later than 6 months after the program was initiated in the county. Participation in the program also must have been continuous for three food readings or 12 months.[9] The initial food reading was taken when the family entered the program, the second one was taken 6 months later, and the third at the end of the first year.

The sample of 148 families was composed of two groups of 74 each. The characteristics of the total sample subdivided by groups are presented in Table 1.

Group 1 families entered the program during February and March 1969. There were 137 families enrolled in the program and after 12 months 86 client families were still actively involved. Of these 86 families, 74 had adequate records for analysis and were included in the analysis.

Group 2 consisted of families enrolled in the program during the late spring and early summer of 1969. There were 369 families initially enrolled but 12 months later 159 families were still actively participating. To have an equal number of participant families for Group 2, a systematic random sample of 74 subjects was taken from the universe of 159 families. Every fifth record was taken from the county's files and if for some reason the record was incomplete, the preceding file was drawn. When an adequately completed record was located, the original procedure was continued. The process was continued until the 74 families for Group 2 were selected.

Operationalization of Variables

The independent variables included in the correlational and regression portion of the study were

[9]The EFNEP aides are required to complete food reading forms at 6-month intervals and these records constituted the data used in this research effort. A total of three food readings was used for analysis purposes.

TABLE 1.—Characteristics of the Sample Population Subdivided by Groups.

Characteristics	Group 1	Group 2
	Percent	Percent
Residence		
Urban	60.3	89.0
Rural nonfarm	39.7	11.0
Receiving welfare		
Yes	41.1	34.3
No	58.9	65.7
Receiving food assistance (other than Food Stamps or Donated Foods)		
Yes	15.3	1.5
No	83.3	76.1
No response	1.4	22.4
Some food is obtained from home garden		
Yes	47.2	13.4
No	51.4	64.2
No response	1.4	22.4
Home is owned	43.1	44.8
Home is rented	56.9	55.2
Homemaker buys most food:		
At supermarket	91.7	97.0
At a small local store	8.3	3.0
Participating in USDA:		
Donated Food Program	0	0
Food Stamp Program	52.8	43.3
Neither	47.2	56.7
Race		
White	4.2	3.0
Negro	95.8	97.0
Income level		
Less than $1,000	11.1	4.5
$1,000-1,999	22.2	10.4
$2,000-2,999	15.3	20.9
$3,000-3,999	16.7	16.4
$4,000-4,999	15.3	17.9
$5,000 and more	19.4	29.9
Mean age of homemaker (years)	45.8	35.9
Mean family size (number)	4.82	4.36

family size, education of homemaker, family income, and number of facilities in the home. The dependent variables were food consumption practices and food knowledge of the homemaker. Data for each of the variables were collected with a standardized Family Record Form used by the Ohio Cooperative Extension Service to gather information about EFNEP families.[10]

The variables were operationalized in the following manner:

- The family size variable was measured in terms of the number of family members.
- The educational variable was measured in terms of the number of years of formal education achieved by the homemaker.
- The facilities variable was measured by noting the number of household facilities available to the homemaker. The facilities noted were: electricity, running water, ice box, refrigerator, freezer, cook stove, oven, and hotplate. The variable was measured in terms of the number of facilities and not the type of facilities.
- The income variable was measured in terms of the family's annual income last year from all sources. The possible sources were wages and salaries, social security, welfare, insurance payments, veterans benefits, pensions, and income after expenses from business and family. The income categories were: less than $1,000, $1,000-1,999, $2,000-2,999, $3,000-3,999, $4,000-4,999, and $5,000 and more. The categories were weighted from 1 to 6 (lowest to highest) and the weighted values were used for analysis.

The *food consumption* variable was defined as the food intake of the homemaker during a previously specified 24-hour period. The homemaker was asked to recall the number of servings of each type of food she had consumed in the previous 24 hours.

The *food knowledge* variable was defined as the information possessed by the homemaker concerning what she believed to be the foods necessary for good health. The homemaker was asked to name what foods people should be consuming to remain healthy and the aide interviewer listed these. Then the data were classified into the various food groupings by the senior aide or home agent.

The food consumption and food knowledge indexes were developed with 2-2-4-4 as the norm to be achieved. The number of servings for each food group was weighted to provide a value for each food category. The weighted values were summed to provide the basis for determining the participant homemaker's score for each food group. A serving in the food consumption index was defined as the intake of a specific food which could be classified into one of the four food groups. A serving in the food knowledge index was the perceived need for intake of foods necessary for good health. Although no specific measurement of quantity of each serving was made, an extremely small quantity of any food product (cream in coffee, etc.) was not counted as a serving. There was no means of differentiating qualitative aspects of the various types of foodstuffs mentioned, since there was no differentiation made between one serving of steak or one serving of bacon. Both were classified as one serving of meat.

[10]The Ohio Cooperative Extension Service has subsequently modified the data collection instruments for the EFNEP.

Representation from each of the food groups was considered nutritionally better than concentration of foods in only one or two groups. To control for this situation, the index was weighted to give priority to a more balanced distribution of foods consumed. The index provided for a weighting of 1 for each serving of the meat and milk groups and a weight of 0.5 for each serving from the bread and cereal group and each serving from the vegetable and fruit group. The maximum value for each of the food groups was 2.0. Therefore, any additional servings within a particular food group, above the optimum level required to meet the daily nutritional needs, produced no increment in the index scoring. The food category subtotals were summed and multiplied by the number of food groups mentioned.

The food consumption index and the food knowledge index were constructed to insure comparability of the two index scores. One index measured actual behavior and the other measured knowledge about what foods were necessary for good health. The categories and weighted values were the same for both indexes to enable a particular client's food consumption score to be compared with her food knowledge score. The methodology employed also permitted comparison of grouped data for both indexes.

The range of possible index scores was 0 to 32, with the highest score representing the desired 2-2-4-4 food norm. A dummy food reading has been constructed (Figure 1) to demonstrate the food consumption techniques. The same procedure was applied to the food knowledge index (Figure 2).

FIG. 1.—24-Hour Food Recall Form with Hypothetical Example.*

Kind of Food and Drink (Enter Main Foods in Mixed Dishes)	Milk	Meat	Veg/Fruit	Bread/Cereal
Response from Client				
Morning				
Milk, orange juice, 2 strips bacon, 2 scrambled eggs, 2 slices toast	1	4	1	2
Midmorning				
Coffee with cream and sugar				
Noon				
Cheese sandwich, tomato soup, soft drink	1		1	2
Afternoon				
Cookies, milk	1			1
Evening				
Meat loaf, mashed potatoes, green beans, lettuce and tomato salad, rolls, peaches		1	4	1
Before Bed				
Ice cream	1			
Total Number of Servings	4	5	6	6
Points	2	2	2	2

Score: 2 + 2 + 2 + 2 (points for each food group) = 8 x 4 = 32.0† (sum of food intake points multiplied by the number of food groups represented)

*The format of this hypothetical food reading schedule was derived from the Family Record—Part 2, Homemaker Food and Family Income and Food Expenditure Record.

†The scoring system was devised by the authors.

FIG. 2.—Food Knowledge Form with Hypothetical Example.

What Food and Drink Do You Think People Should Have to Keep Healthy?	Milk	Meat	Veg/Fruit	Bread/Cereal
Response from Client				
Milk cheese, ice cream, chicken, fish, eggs	3	3		
Corn, carrots, green beans, lettuce, apples, peaches, fruit juice			7	
Rolls, bread, oats				3
Total Number of Servings	3	3	7	3
Points	2	2	2	1.5

Score: 2 + 2 + 2 + 1.5 (points for each food group) = 7.5 x 4 = 30.0 (sum of food knowledge points multiplied by the number of food groups represented)

*The format for this hypothetical food knowledge form was devised from the Family Record—Part 2.

Data Input for Regression Analysis

The food consumption index scores were computed for each client family for each of the 6-month periods of program participation. The third food consumption index score was subtracted from the first food consumption index score to provide an indication of whether or not change in food consumption had occurred during the time of program involvement. The resultant values provided the means for determining whether progression, no change, or regression occurred for each family in terms of food consumption.

The difference between the food consumption index scores for time periods 3 and 1 was denoted as the dependent variable and subjected to correlational and step-wise regression analysis. The same procedure was applied to the food knowledge index scores. The regression analysis was conducted to determine the relationship between the independent variables and each of the two dependent variables for the total sample.

Data Input for T-test Analysis

T-tests for differences between means were used to determine whether or not significant changes in food consumption and food knowledge occurred within the two groups during involvement in the program. The input data consisted of the individual homemaker's food consumption and food knowledge index scores grouped by time of entry into the EFNEP. The grouped scores were compared for the three food reading periods. The groups' (1 and 2) food consumption and food knowledge index scores were compared for food readings 1, 2, and 3. The two indexes were also compared with each other over the three food reading periods for both groups to test the dissonance reduction component of the theory.

Study Limitations

The research findings may be somewhat limited since the data utilized were collected by neighborhood aides during educational visits to the participant families' homes. The interview schedule was not constructed or administered primarily as a research tool, but rather as an information and evaluation source for the aide and the Extension staff. The aides were low-income residents of the community who were trained as para-professionals to operationalize the EFNEP and were not trained as research interviewers per se. The lack of research training among the neighborhood aides may be mitigated somewhat since the demographic questions contained in the schedule were objective in nature and not subject to interviewer bias.

The food recall and food knowledge questions, however, were answered with open-end responses which showed evidence of aide interpretation in an earlier study (12, p. 12). The USDA report indicated that aides tended to group responses to food consumption recall at particular scores. For example, an aide may record food recalls for her clients which tend to cluster in a particular range of scores. The USDA study also suggested that it was possible that the aide was *prompting* the homemaker's response by perhaps mentioning different foods before the homemaker responded to the question. Similarly, the same study suggested that the food knowledge score was somewhat affected by the aide's personal knowledge and her ethnic background.

Even with the limitation noted in the USDA study, it was reported that significant improvement in the food recall records (food consumption) of homemakers occurred as a result of program participation. This was noted to be true even when potential aide biasing during data collection was considered. While it is readily admitted that it is possible that some interviewer bias could be present in this research, the authors are confident that the methodology employed to use the existing data source is valid.

RESEARCH RESULTS AND DISCUSSION

The results of this research revealed that significant improvement occurred in food consumption practices and food knowledge of the homemakers during the 12-month involvement in the EFNEP for both Groups 1 and 2. The t-test findings indicated that significant improvement occurred in both groups between food readings 1 and 3 for both dependent variables.

The correlation and regression analysis, however, revealed that none of the independent variables was significant in the explanation of the food consumption and food knowledge changes occurring within the families studied. The regression analysis demonstrated that the independent variables explained only 3% of the variance in the food consumption index score changes and less than 3% of the variance in the food knowledge index.

Only the number of facilities in the home was significantly correlated with change in the food consumption index scores (time 3 food reading score minus time 1 food reading score), but the correlation was extremely low (—0.1855). Since the dependent variable was operationalized as change in food consumption patterns, the correlation suggests that homemakers who possessed more numerous facilities did not change their behavioral patterns as much as those with fewer facilities. Those who possessed the facilities may have had better food consumption practices at the beginning of the program and did not

have to make extensive modification of behavior. However, the correlation was extremely low. There were no significant correlations between the independent variables and change in the food knowledge index scores as indicated in the correlation matrix (Table 2).

The regression equation for changes in food consumption index scores from food reading 1 to food reading 3 is presented below in standardized beta values:

Regression Equation for Selected Independent Variables and Changes in Food Consumption Index Scores

$$y = 19.4 - 0.0273x_1 - 0.0934x_2 - 0.1970x_3 + 0.0054x_4 + e$$

where:

- y = Changes in food consumption index scores from food reading 1 to food reading 3
- x_1 = Number of family members
- x_2 = Educational achievement level (homemaker)
- x_3 = Number of facilities in the home
- x_4 = Family income
- e = Unexplained variance

The regression equation for the changes in food knowledge index scores from food reading 1 to food reading 3 is presented below in standardized beta values:

Regression Equation for Selected Independent Variables and Changes in Food Knowledge Index Scores

$$y = 5.3 + 0.1687x_1 + 0.0537x_2 + 0.0229x_3 - 0.1879x_4 + e$$

where:

- y = Changes in food knowledge index scores from food reading 1 to food reading 3
- x_1 = Number of family members
- x_2 = Educational achievement level (homemaker)
- x_3 = Number of facilities in the home
- x_4 = Family income
- e = Unexplained variance

The correlation and regression results revealed that the independent variables included in the analyses were insignificant in explaining changes in either of the two dependent variables. This suggests that response of client families cannot be predicted by family size, educational achievement level of homemaker, number of facilities in the home, or family income. Apparently some client homemakers with low scores on the independent variables significantly increased their food consumption and food knowledge, while others decreased or improved less rapidly. The same is true for those client families with higher scores on the independent variables.

Food Consumption Findings

The t-test findings (Table 3) reveal that both Groups 1 and 2 changed food consumption patterns and food knowledge during their involvement in the EFNEP. Table 3 shows that Group 1 significantly improved its mean food consumption score from 15.4 to 20.7 during the first 6 months of the program. This was a significant change as demonstrated by the t-test score of 4.2 (significant at the .001 level). Group 2 started at a higher level (20.1 at food reading 1) and its food consumption index scores did not significantly improve during the first 6 months (21.2 at food reading 2). The t-test score for Group 2 during this period was 0.8, which was not significant at the .05 level.

Table 3 also reveals that Group 1 did not significantly improve food consumption behavior during the remaining period of program participation (food readings 2 and 3). The food consumption index scores were 20.7 at food reading 2 and 21.7 at food reading 3, which were not significantly different at the .05 level (t-test = 0.7). The same findings were noted for Group 2 during the same time periods. Group 2 improved slightly but the improvement was not significant at the .05 level. The food consumption index scores for Group 2 were 21.2 for food reading 2 and 22.9 for food reading 3 (t-test = 1.3).

Both Groups 1 and 2 were significantly different in terms of food consumption index scores at food readings 1 and 3. Group 1 improved its food consumption index mean score from 15.4 to 21.7, which

TABLE 2.—Correlation Matrix for Selected Independent Variables and Changes in Food Consumption and Food Knowledge Index Scores.

Number of Family Members	$\bar{X}$ (1)	$\bar{X}$ (1) 1.0					
School Years Completed by Homemaker	$\bar{X}$ (2)	$\bar{X}$ (1) 0.0749	$\bar{X}$ (2) 1.0				
Number of Facilities in the Home	$\bar{X}$ (3)	$\bar{X}$ (1) 0.0818	$\bar{X}$ (2) —0.1422	$\bar{X}$ (3) 1.0			
Income Level of the Family	$\bar{X}$ (4)	$\bar{X}$ (1) 0.3379**	$\bar{X}$ (2) 0.2736**	$\bar{X}$ (3) 0.0782	$\bar{X}$ (4) 1.0		
Change in the Food Consumption Index Score	$\bar{X}$ (5)	$\bar{X}$ (1) —0.0486	$\bar{X}$ (2) —0.0660	$\bar{X}$ (3) —0.1855*	$\bar{X}$ (4) —0.0448	$\bar{X}$ (5) 1.0	
Change in the Food Knowledge Index Score	$\bar{X}$ (6)	$\bar{X}$ (1) 0.1112	$\bar{X}$ (2) 0.0116	$\bar{X}$ (3) 0.0144	$\bar{X}$ (4) —0.1144	$\bar{X}$ (5) 0.0860	$\bar{X}$ (6) 1.0

*Significant at the .05 level.
**Significant beyond the .01 level.

TABLE 3.—Summary Statistics for Difference Between Means Test for Food Readings, 1, 2, and 3.

		Food Reading 1	Food Reading 2	Food Reading 3	t-test Scores by Food Reading with 146 Degrees of Freedom
Food Consumption Index Scores	Group 1	$\bar{X}$ = 15.4 SD = 6.7	$\bar{X}$ = 20.7 SD = 8.3	$\bar{X}$ = 21.7 SD = 8.3	Food Readings 1 and 2 = 4.2*** Food Readings 2 and 3 = 0.7 Food Readings 1 and 3 = 5.0***
	Group 2	$\bar{X}$ = 20.1 SD = 7.6	$\bar{X}$ = 21.2 SD = 8.5	$\bar{X}$ = 22.9 SD = 7.6	Food Readings 1 and 2 = 0.8 Food Readings 2 and 3 = 1.3 Food Readings 1 and 3 = 2.3*
Food Knowledge Index Scores	Group 1	$\bar{X}$ = 12.5 SD = 6.9	$\bar{X}$ = 16.4 SD = 8.6	$\bar{X}$ = 19.4 SD = 9.0	Food Readings 1 and 2 = 3.0* Food Readings 2 and 3 = 2.1* Food Readings 1 and 3 = 5.2***
	Group 2	$\bar{X}$ = 15.2 SD = 10.0	$\bar{X}$ = 17.8 SD = 7.7	$\bar{X}$ = 21.4 SD = 7.9	Food Readings 1 and 2 = 1.8 Food Readings 2 and 3 = 2.8** Food Readings 1 and 3 = 4.2**

*=Significant at the .05 level.
**=Significant at the .01 level.
***=Significant at the .001 level.

was a significant difference at the .001 level (t-test = 5.0). Group 2 improved its mean consumption index score from 20.1 to 22.9, which was a significant difference at the .05 level (t-test = 2.3).

These findings clearly demonstrate that EFNEP involvement consistently resulted in positive advancement toward the accepted food consumption norm of 2-2-4-4 during the first 12 months of program participation. Group 1 improved relatively more than Group 2, but this is a partial function of Group 2 starting with a higher initial food index score.

It is interesting to note that the increment in food consumption index scores was smaller for Group 1 between food readings 2 and 3 than between food readings 1 and 2. This suggests that an extended period of program involvement may not cause continued significant improvement. Client families may tend to *plateau* at some level of prolonged program involvement. This suggests that some clients should be *graduated* to other programs when food consumption change ceases to be rapidly improved. Longitudinal research should be conducted to determine if the long-term client families tend to remain at the same level for extended periods.

If subsequent longitudinal research should indicate that these findings can be generalized to other EFNEP case study counties, program personnel should consider the termination of long-term client membership and encourage these client homemakers to participate in other Extension-oriented programs which may be useful in removing other obstacles for social mobility of low-income people. Apparently the greatest impact on behavioral change for the total study group occurred during the first 6 months of the program involvement.

Food Knowledge Findings

Table 3 also reveals that significant changes in food knowledge index scores occurred in Groups 1 and 2. Group 1 scores for the three food readings were 12.5, 16.4, and 19.4, demonstrating a steady improvement toward the 2-2-4-4 norm for all periods.

The mean food knowledge index scores for Group 2 for the three food readings were 15.2, 17.8 and 21.4. The food knowledge index scores were significantly improved between food readings 2 and 3 and food readings 1 and 3, but not significantly different for food readings 1 and 2. The greatest change occurred in the later stages of program involvement for Group 2.

Dissonance Reduction Theory Tested

Results for food consumption index scores and food knowledge index scores were compared by research groups and food readings (Table 4). The theoretical position to be tested basically stated: *Food knowledge will change more rapidly than food consumption and cognitive dissonance will be reduced by a convergence of food consumption and food knowledge scores.*

The findings strongly supported the theoretical model that convergence of food consumption index and food knowledge scores would occur, since both groups followed this pattern. However, the relationship between the food knowledge and food consumption index scores was not expected. Both groups had higher food consumption index scores at each food reading than food knowledge index scores.

The mean food consumption index scores for Group 1 for the three food readings were 15.4, 20.7,

and 21.7. The mean food knowledge index scores for Group 1 were 12.5, 16.4, and 19.4. The mean food consumption scores for Group 2 were 20.1, 21.2, and 22.9, while the mean food knowledge index scores were 15.2, 17.8, and 21.4. The findings are graphically presented in Figures 3-6.

The convergence pattern was basically the same for both groups. The mean food consumption and mean food knowledge index scores for both groups were significantly different at the first food reading, but the differences were eliminated in both groups by the third food reading.

TABLE 4.—Summary Statistics for Difference Between Means Test for Food Consumption and Knowledge.

	Food Consumption Index Scores	Food Knowledge Index Scores	t-test Scores with 146 Degrees of Freedom
Group 1			
Food Reading 1	$\bar{X}$ = 15.4 SD = 6.7	$\bar{X}$ = 12.5 SD = 6.9	2.6**
Food Reading 2	$\bar{X}$ = 20.7 SD = 8.3	$\bar{X}$ = 16.4 SD = 8.6	3.1***
Food Reading 3	$\bar{X}$ = 21.7 SD = 8.3	$\bar{X}$ = 19.4 SD = 9.0	1.6*
Group 2			
Food Reading 1	$\bar{X}$ = 20.1 SD = 7.6	$\bar{X}$ = 15.2 SD = 10.0	3.3***
Food Reading 2	$\bar{X}$ = 21.2 SD = 8.5	$\bar{X}$ = 17.8 SD = 7.7	2.5**
Food Reading 3	$\bar{X}$ = 22.9 SD = 7.6	$\bar{X}$ = 21.4 SD = 7.9	1.2*

*=Not significant at .05 level.
**=Significant at 0.5 level.
***=Significant at .01 level.

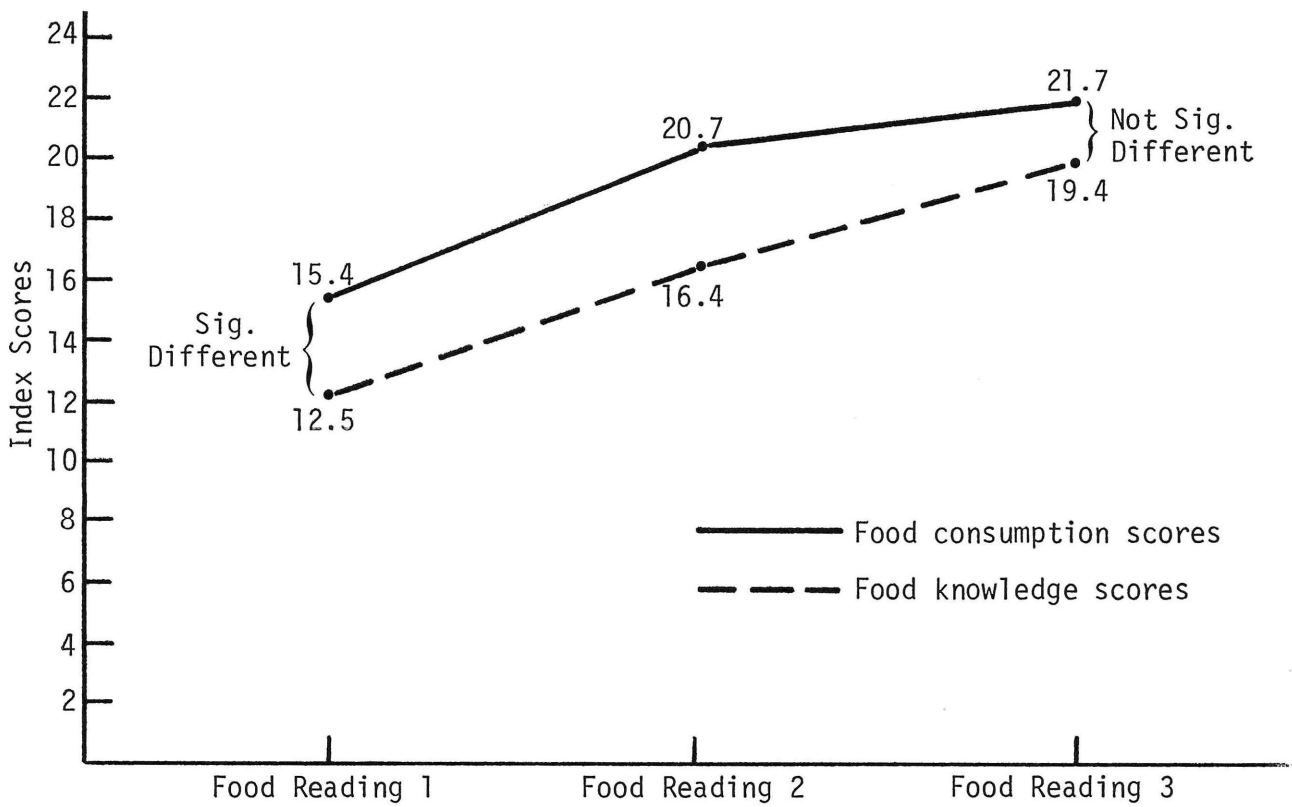

FIG. 3.—Comparison of Mean ($\bar{X}$) Food Consumption and Food Knowledge Index Scores for Group 1: A Test of Convergence.

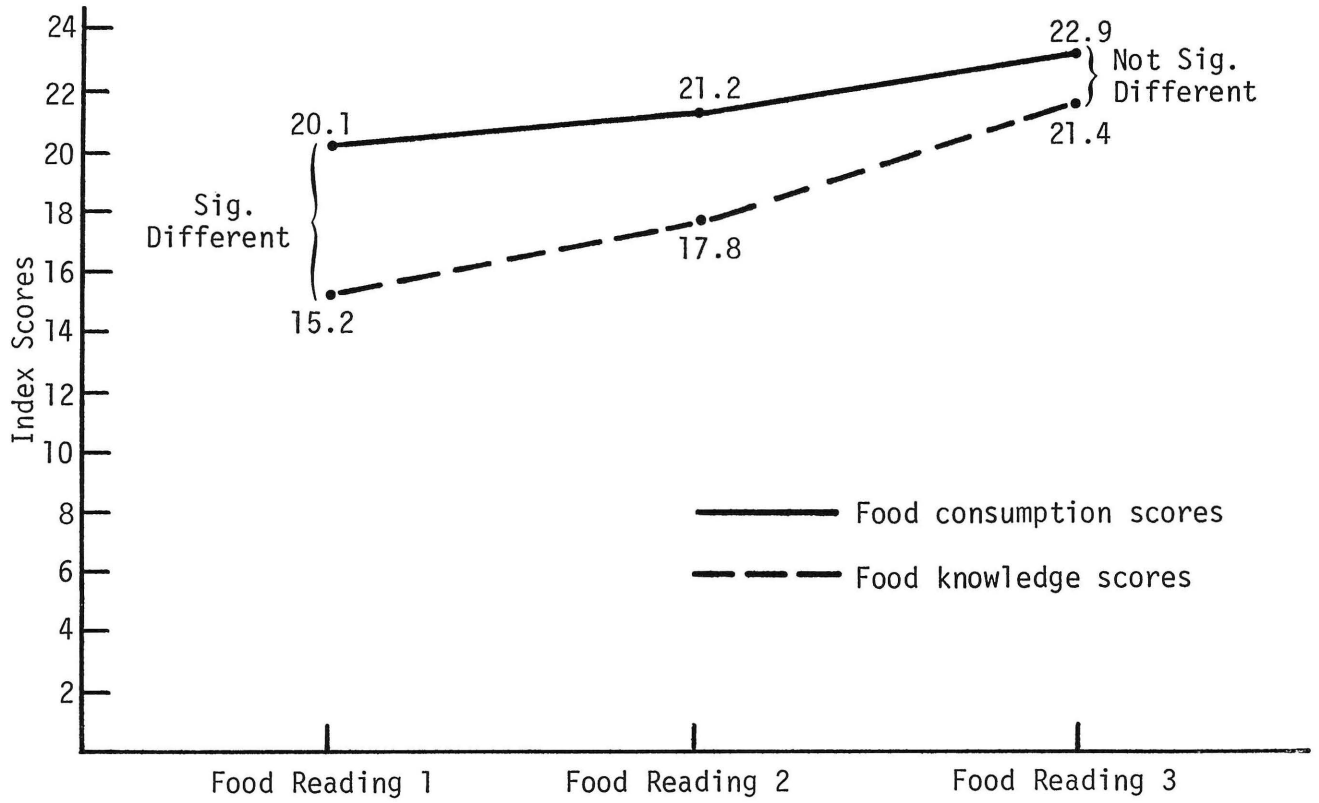

FIG. 4.—Comparison of Mean ($\bar{X}$) Food Consumption and Food Knowledge Index Scores for Group 2: A Test of Convergence.

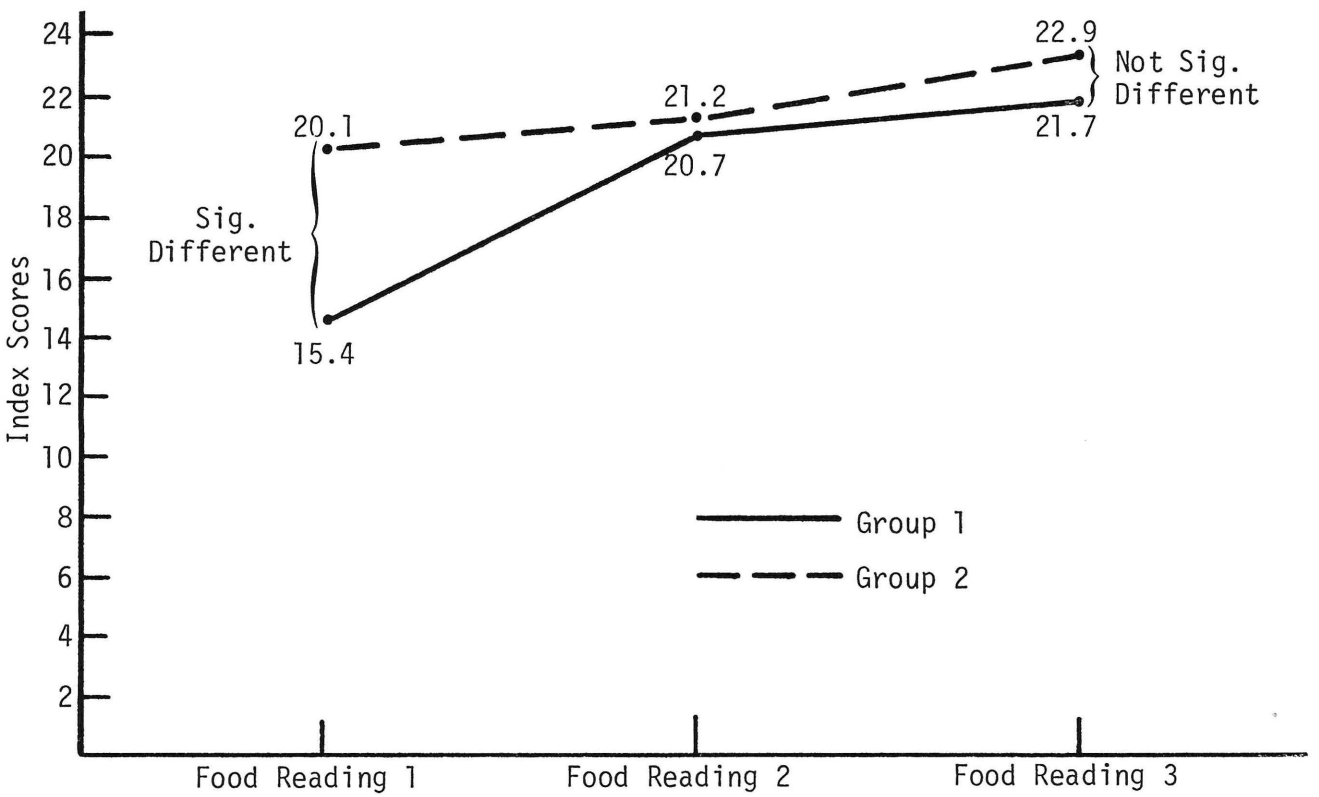

FIG. 5.— Comparison of Mean ($\bar{X}$) Food Consumption Index Scores for Groups 1 and 2: A Test of Convergence.

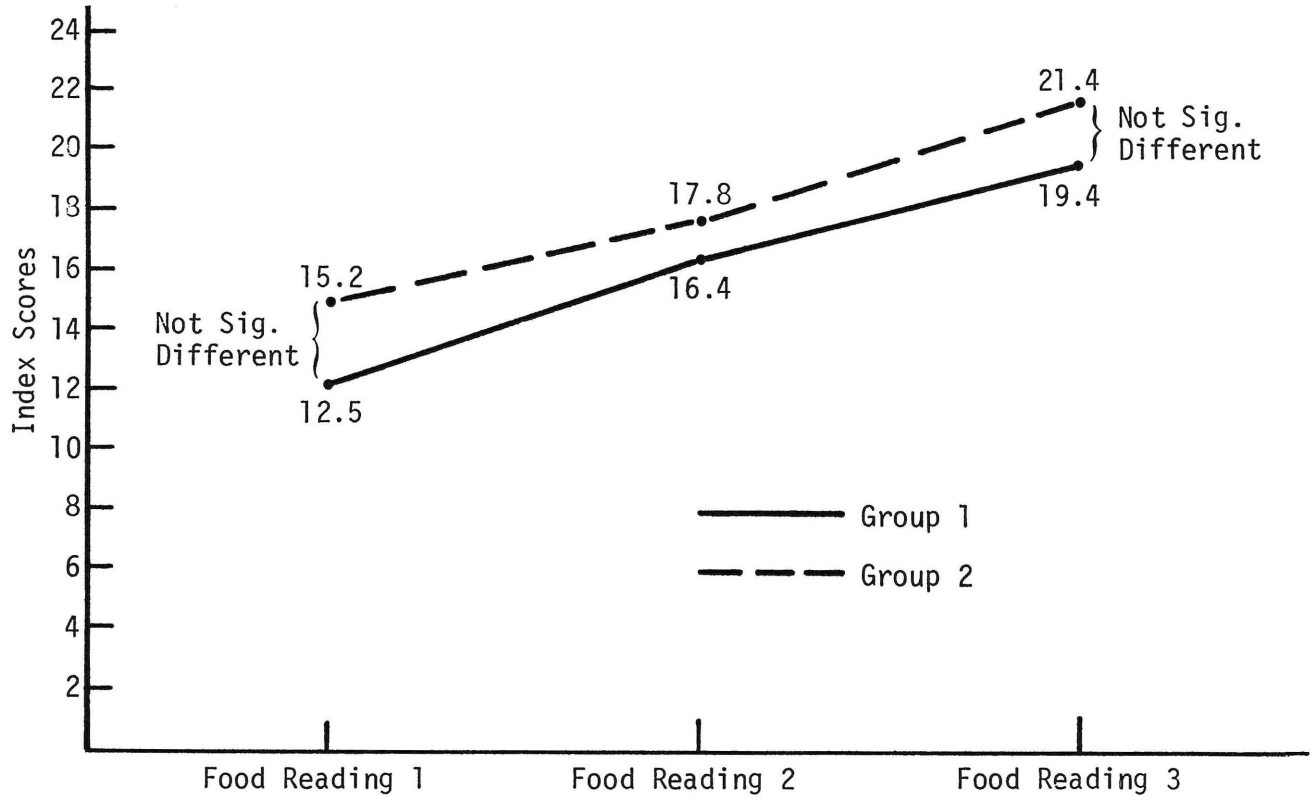

FIG. 6.—Comparison of Mean ($\bar{X}$) Food Knowledge Index Scores for Groups 1 and 2: A Test of Convergence.

In terms of the theoretical model, the convergence concept of the dissonance theory was supported, but the hypothesized direction of initial differences was not. Apparently the client homemakers were providing more balanced diets (2-2-4-4) to their families than their food knowledge would suggest. It is highly probable that this was a function of early socialization in terms of food preparation. It is argued that the client homemaker was preparing and serving certain foods to her family without extensive nutritional knowledge of why she should be preparing them. This suggests that the client homemakers may have been relying upon custom rather than nutrition knowledge. In this situation, food knowledge lagged behind food consumption for both groups.

It is also possible that the aide influence may have been operative in this situation. The homemaker may have perceived the aide as having particular expertise and adopted the suggestions of the aide without fully understanding the nutritional rationale for the action. The homemaker may have been relying upon the expertise of the aide in the particular situation.

The t-test findings tended to show that significant postive behavioral change occurred in terms of moving toward the optimum food consumption norm (2-2-4-4), since food consumption and food knowledge increased for both groups. A further test was devised to determine whether the two groups differed in terms of benefits derived from the program. Table 1 reveals several significant differences between Groups 1 and 2. Group 1 differed from Group 2 since it had a larger percentage of rural nonfarm population, contained more families on welfare, the homemakers were older, the client families were larger in size, and the families had lower annual incomes.

These differences suggest that the two groups began the program with different food consumption behavioral patterns and food knowledge scores.

The t-test findings comparing the groups by food consumption and food knowledge index scores are in Table 5. The findings indicate that the groups were significantly different at food reading 1 in terms of the food consumption index scores, but that the differences were eliminated by the second food reading. There were also no significant differences at the end of food reading 3 for the two groups.

The comparison of the groups' food knowledge scores revealed no significant differences at the begin-

TABLE 5.—Comparison of Groups 1 and 2 on Food Consumption Index Scores and Food Knowledge Index Scores for Food Reading Periods.

		Group 1	Group 2	t-test Score with 146 Degrees of freedom
Food Consumption Index Scores	Food Reading 1	$\bar{X}$ = 15.4 SD = 6.7	$\bar{X}$ = 20.1 SD = 7.6	3.9**
	Food Reading 2	$\bar{X}$ = 20.7 SD = 8.3	$\bar{X}$ = 21.2 SD = 8.5	0.4*
	Food Reading 3	$\bar{X}$ = 21.7 SD = 8.3	$\bar{X}$ = 22.9 SD = 7.6	0.9*
Food Knowledge Index Scores	Food Reading 1	$\bar{X}$ = 12.5 SD = 7.0	$\bar{X}$ = 15.2 SD = 10.0	1.9*
	Food Reading 2	$\bar{X}$ = 16.4 SD = 8.6	$\bar{X}$ = 17.8 SD = 7.7	1.1*
	Food Reading 3	$\bar{X}$ = 19.4 SD = 9.0	$\bar{X}$ = 21.4 SD = 7.9	1.4*

*Not significant at the .05 level.
**Significant at the .01 level.

ning of the program. Subsequent comparisons of the groups revealed no significant differences during their participation in the program.

These findings are especially important to program developers and implementors, since the data suggest that clients with various backgrounds (in terms of the socio-economic variables analyzed) tended to benefit from the program. The benefits, in essence, were not confined to any particular family income grouping (most incomes were low) but were distributed throughout the client families regardless of characteristics.

While the influence of aide visits was not discussed per se in this study, a zero order correlation for Group 1 (data missing for Group 2) was computed between number of program aide visits per family and the difference between food consumption and food knowledge index scores for food readings 1 and 3. The correlation was practically nonexistent for both dependent variables and number of aide visits (0.0293 and 0.0134, respectively). This strongly suggests that increasing the number of aide visits per family would have little effect in bringing about food consumption and food knowledge change.

CONCLUSIONS AND RECOMMENDATIONS

The findings strongly suggest that the participant families benefited positively from their involvement in the EFNEP. There was significant improvement for both groups in terms of food consumption practices and food knowledge, using the 2-2-4-4 food pattern as the optimum level to be achieved. The correlation analysis revealed that no individual characteristics could be isolated which were useful in the explanation of the changes in either the food consumption or the food knowledge index scores.

The first 6 months of the program appeared to be the period for greatest improvement of food consumption practices (using total group data), with a decreasing rate of increase during the second 6-month period. This finding suggests that prolonged program involvement may not result in continued significant improvement. This implies that graduation to other programs designed to eliminate other impediments to increased achievement should be considered. Food knowledge increased over time, but a pattern of rapid initial improvement with declining rate of improvement was not noted.

It was interesting to note that the food consumption index scores were initially greater than food knowledge scores, suggesting that the homemakers were serving foods without knowing the nutritional reason for serving them. Learning about food knowledge apparently was lagging behind food practices. This could have been a partial result of program aides suggesting that the homemaker practice certain behavioral patterns, even though the homemaker may not have known why. It may also have been a function of early homemaking socialization. The young homemaker-to-be may have relied on her mother concerning what were socially acceptable foods and how to prepare them. It could be argued that once food consumption patterns are established, people determine what they *like* and proceed to eat the foods defined as desirable. The desirable foods and customs established may partially overcome deficiencies in nutrition knowledge.

In summary, the program in this case study county appeared to have produced positive effects on the

client families. The institutional change was provided by the Ohio Cooperative Extension Service by making it possible for people to learn about food and nutrition. The program was also predicated upon the willingness of participants to modify behavior and attitudes. The combination of these two positions (some institutional and some individual change) apparently produced the mechanism for positive results in food consumption and food knowledge as operationalized in this research effort.

Recommendations for Future Research

Future evaluation of the EFNEP should definitely include much more social, economic, and social-psychological analyses. While food consumption and food knowledge are important aspects of the program, there are undoubtedly many other beneficial aspects which are being ignored. Participation in formal and informal organizations could be an important factor to evaluate. It is highly probable that contact with Extension personnel has had an integrating effect upon client families in terms of small group and community involvement. Perhaps the EFNEP has reduced the feelings of personal estrangement of families and this area should also be carefully analyzed.

Research should be conducted among families who voluntarily removed themselves from the program. This area of research should determine the *lasting* effect of the program in terms of retention of nutrition knowledge and food consumption practices, what factors are associated with early *graduation* from the program, the program strengths and weaknesses as perceived by former participants, what type of involvement the graduated families have in other Extension activities, and what additional programs would be beneficial to graduated families.

The suggested research should include comparative analysis of participating and non-participating family units which are similar in socio-economic characteristics. A random sample should also be drawn from the total universe (county, state, region, or nation) to determine the index scores for a representative sample. The researcher could then note how the EFNEP client families rank relative to a representative population.

The authors recommend that research instrumentation be developed and employed as data collection devices, rather than general information gathering instruments for program monitoring. Attitudinal scales and social indexes designed for specific research purposes would enhance the credibility of evaluative research findings. The data should be collected by trained personnel, not associated directly with the program, to ensure minimal interviewer biases. It is also recommended that the research be of a longitudinal nature with several restudies to compare the research findings discussed in this bulletin, especially the possibility that client families may plateau after a relatively short period of program involvement.

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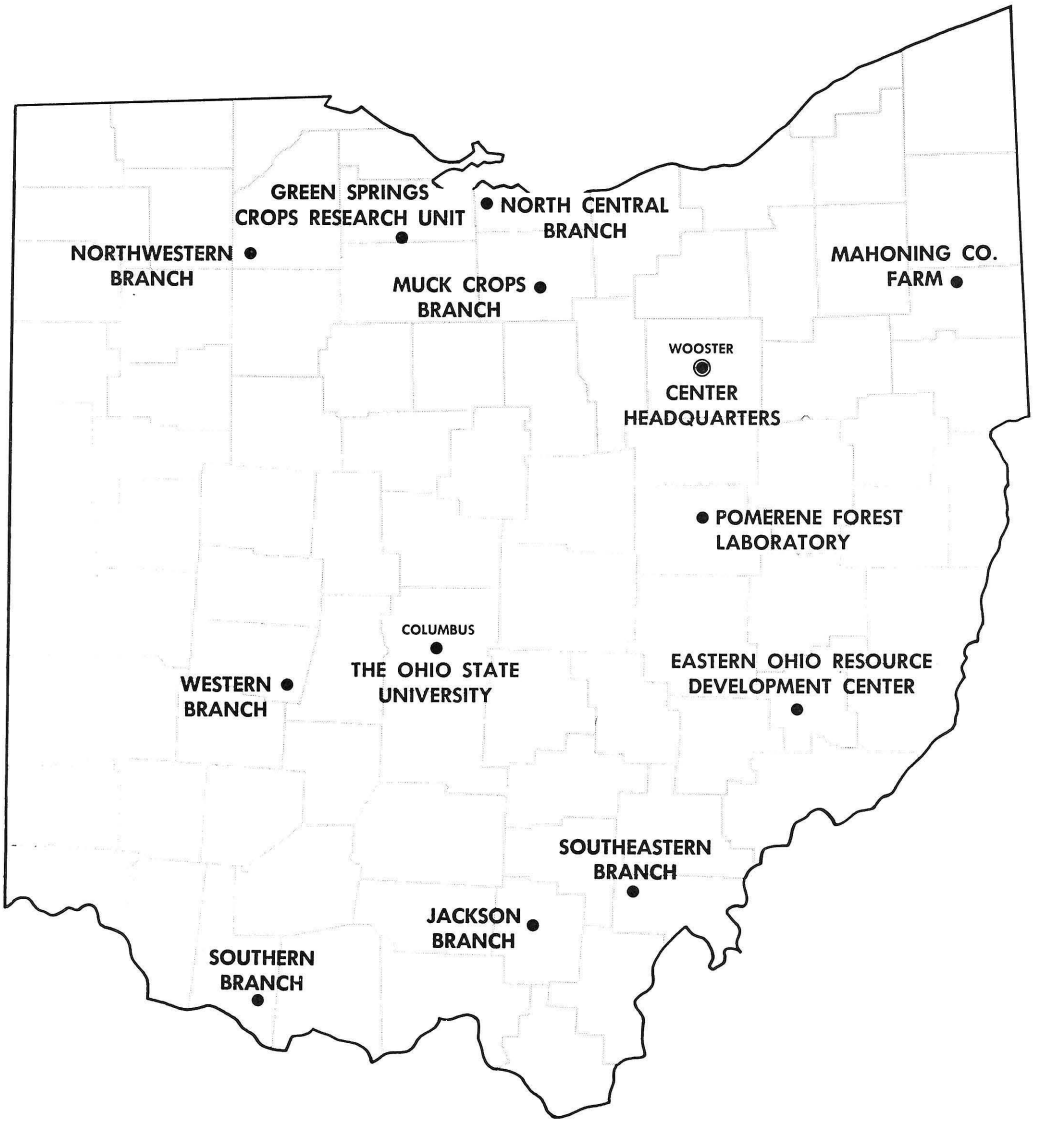

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Pomerene Forest, Laboratory, Keene Township, Coshocton County: 227 acres

Southeastern Branch, Carpenter, Meigs County: 330 acres

Southern Branch, Ripley, Brown County: 275 acres

Western Branch, South Charleston, Clark County: 428 acres